

WHAT IS CLAIMED IS:

1. A dielectric resonator device comprising:
  - at least two adjacent dielectric resonators that each resonate in at least a first and a second resonant mode, said first resonant mode and said second resonant mode having respective magnetic loops which are orthogonal with respect to each other;
  - a partitioning plate located between said at least two adjacent dielectric resonators, said partitioning plate including slits, said magnetic loop of said first resonant mode of said at least two adjacent dielectric resonators passing along a length of the slits; and
  - a conductor loop provided with said partitioning plate, said conductor loop including a first conductor loop portion coupled to said second resonant mode of a first dielectric resonator of said at least two adjacent dielectric resonators and a second conductor loop portion coupled to said second resonant mode of a second dielectric resonator of said at least two adjacent dielectric resonators.
2. The dielectric resonator device according to claim 1, wherein said conductor loop is disposed such that it passes through one of said slits.
3. The dielectric resonator device according claim 1, further comprising:
  - a wall surrounding said at least two adjacent dielectric resonators and forming a cavity; and
  - slit gaps provided parallel to said slits, said slit gaps positioned between said wall of said cavity and side portions of said partitioning plate.
4. The dielectric resonator device according to claim 1, further comprising:
  - a wall surrounding said at least two adjacent dielectric resonators and forming a cavity; and

a set of opposed projections extending from said wall into said cavity, said partitioning plate positioned between said set of opposed projections.

5. The dielectric resonator device according to claim 1, further comprising:

a wall surrounding said at least two adjacent dielectric resonators and forming a cavity; and

a set of opposed recesses in said wall of said cavity, said partitioning plate positioned within said set of opposed recesses.

6. The dielectric resonator device according to claim 1, further comprising:

a wall surrounding said at least two adjacent dielectric resonators and forming a cavity;

a set of opposed projections extending from said wall into said cavity; and

respective recess provided in each of said opposed projections, said partitioning plate positioned within said respective recesses.

7. The dielectric resonator device according to claim 1, wherein said first conductor loop portion and said second conductor loop portion are integrally formed with the partitioning plate.

8. A communication filter comprising:

the dielectric resonator device set forth in claim 1; and

an external coupling unit which is externally coupled to the dielectric resonator device.

9. A communication unit for a mobile communication base station, the communication unit comprising:

a high frequency circuit that allows a predetermined band of a communication signal to pass through, the high frequency circuit including the communication filter set forth in claim 8.

10. The dielectric resonator device according to claim 1, wherein coupling of said second resonant mode between said at least two adjacent dielectric resonators caused by a leakage of magnetic fields of said second resonant mode through the slits is canceled out by coupling said magnetic fields of said second resonant mode of said at least two adjacent dielectric resonators through said first conductor loop portion and said second conductor loop portion.

11. The dielectric resonator device according to claim 10, wherein coupling of said second resonant mode between said at least two adjacent dielectric resonators caused by a leakage of said magnetic fields of the second resonant mode through the slits is canceled out by an arrangement of relative positions of said first conductor loop portion and said second conductor loop portion and an arrangement of relative positions of grooves provided in said at least two adjacent dielectric resonators.

12. A dielectric resonator device comprising:  
at least two adjacent dielectric resonators that each resonate in at least a first and a second resonant mode, said first resonant mode and said second resonant mode having respective magnetic loops which are orthogonal with respect to each other;

a partitioning plate located between said at least two adjacent dielectric resonators, said partitioning plate including slits, said magnetic loop of said first resonant mode of said at least two adjacent dielectric resonators passing along a length of the slits; and

a conductor loop provided with said partitioning plate, said conductor loop including a first conductor loop portion coupled to said first resonant mode of a first dielectric resonator of said at least two adjacent dielectric resonators and a second

conductor loop portion coupled to said second resonant mode of a second dielectric resonator of said at least two adjacent dielectric resonators.

13. The dielectric resonator device according to claim 12, wherein said conductor loop is disposed such that it passes through one of said slits.

14. The dielectric resonator device according claim 12, further comprising:  
a wall surrounding said at least two adjacent dielectric resonators and forming a cavity; and  
slit gaps provided parallel to said slits, said slit gaps positioned between said wall of said cavity and side portions of said partitioning plate.

15. The dielectric resonator device according to claim 12, further comprising:  
a wall surrounding said at least two adjacent dielectric resonators and forming a cavity; and  
a set of opposed projections extending from said wall into said cavity, said partitioning plate positioned between said set of opposed projections.

16. The dielectric resonator device according to claim 12, further comprising:  
a wall surrounding said at least two adjacent dielectric resonators and forming a cavity; and  
a set of opposed recesses in said wall of said cavity, said partitioning plate positioned within said set of opposed recesses.

17. The dielectric resonator device according to claim 12, further comprising:  
a wall surrounding said at least two adjacent dielectric resonators and forming a cavity;  
a set of opposed projections extending from said wall into said cavity;  
and

respective recess provided in each of said opposed projections, said partitioning plate positioned within said respective recesses.

18. The dielectric resonator device according to claim 12, wherein said first conductor loop portion and said second conductor loop portion are integrally formed with the partitioning plate.

19. A communication filter comprising:  
the dielectric resonator device set forth in claim 12; and  
an external coupling unit which is externally coupled to the dielectric resonator device.

20. A communication unit for a mobile communication base station, the communication unit comprising:  
a high frequency circuit that allows a predetermined band of a communication signal to pass through, the high frequency circuit including the communication filter set forth in claim 19.